CLAIMS

I claim:

1. A method of forming diamond comprising:

providing a substrate in a reaction chamber in a non-magnetic-field microwave plasma system;

introducing, in the absence of a gas stream, a liquid precursor substantially free of water and containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one, into an inlet of the reaction chamber;

vaporizing the liquid precursor; and

subjecting the vaporized precursor, in the absence of a carrier gas and in the absence in a reactive gas, to a plasma under conditions effective to disassociate the vaporized precursor and promote diamond growth on the substrate in a pressure range from about 70 to 130 Torr.

2. The method of claim 1, wherein the carrier gas is hydrogen (H_2).

3. The method of claim 1, wherein the pressure range is from 80 to 130 Torr.

4. The method of claim 1, wherein the pressure range is from 110 to 130 Torr.

5. The method of claim 4, wherein the methanol is from about 50 to 96 weight percent of the liquid precursor.

6. The method of claim 1, wherein the methanol is from about 50 to 96 weight percent of the liquid precursor.

7. The method of claim 1, wherein the methanol is from about 73 to 96 weight percent of the liquid precursor.

8. The method of claim 1, wherein the methanol is from about 90 to 96 weight percent of the liquid precursor.

9. The method of claim 1, wherein the at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one are selected from ethanol, acetone, isopropanol, and combinations thereof.

10. A method of forming diamond comprising:

providing a substrate in a reaction chamber in a non-magnetic-field microwave plasma system, the reaction chamber being in fluidic communication with a container through a metering valve, wherein the container includes a liquid precursor substantially free of water containing methanol and at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one;

flowing the liquid precursor into the reaction chamber using the metering valve, in the absence of a gas stream flowing through the metering valve entraining the liquid precursor, wherein the liquid precursor vaporizes during entry into the reaction chamber;

vaporizing the liquid precursor;

subjecting the vaporized precursor to a plasma under conditions effective to disassociate the vaporized precursor in the absence of a carrier gas and in the absence in a reactive gas; and

promoting diamond growth on the substrate at a pressure in the range from about 10 to 130 Torr.

11. The method of claim 10, wherein the methanol is from about 50 to 96 weight percent of the liquid precursor, and wherein the pressure range is from 70 to 130 Torr.

12. The method of claim 10, wherein the methanol is from about 73 to 96 weight percent of the liquid precursor, and wherein the pressure range is from 110 to 130 Torr.

13. The method of claim 10, wherein the methanol is from about 90 to 96 weight percent of the liquid precursor, and wherein the pressure range is from 110 to 130 Torr.

14. The method of claim 10, wherein the carrier gas is hydrogen (H_2).

15. The method of claim 10, wherein the reactive gas is hydrogen (H_2).

16. The method of claim 13, wherein the carrier gas is hydrogen (H_2).

17. The method of claim 13, wherein the reactive gas is hydrogen (H_2).

18. The method of claim 17, wherein the at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one is ethanol.

19. The method of claim 17, wherein the at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one is acetone.

20. The method of claim 17, wherein the at least one carbon and oxygen containing compound having a carbon to oxygen ratio greater than one is isopropanol.

21. The method of claim 10, wherein the substrate does not include a pre-deposition seeding of diamond particles on the surface of the substrate.

22. The method of claim 10, wherein the substrate is aluminum.

23. The method of claim 10, wherein the metering valve includes a temperature measuring device coupled to the tip of the metering valve, wherein the vaporization of the liquid precursor causes the metering valve to decrease in temperature to a temperature value, wherein the temperature value is correlated to a flow rate of the liquid precursor, wherein the flow rate of the liquid precursor into the reaction chamber can be substantially reproduced by opening the metering valve to an extent so that the temperature value is obtained.

24. The method of claim 23, wherein the container includes a volume of the precursor liquid at atmospheric pressure, wherein the liquid precursor is adapted to be replenished during the formation of the diamond without interrupting the formation thereof.